Thermochronological constraints on the post-depositional thermal history of the Permian-Triassic Beacon Basin, Transantarctic Mountains, Antarctica

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Minerals crystallize at specific temperatures. The time at which they crystallize can be dated and used to investigate the thermal history of rocks which contain the minerals. In order to investigate the thermal history of a 3 km thick sedimentary basin sequence in the Transantarctic Mountains (TAM), Antarctica, a combination of U-Pb and U-Th/He double dating techniques was used on zircon and apatite mineral grains. Six *in* situ samples were selected from the lower, middle, and upper formations of the Beacon Supergroup (Pagoda, Buckley, and Falla, respectively) in two locations along the central TAM, the Queen Alexandra Range (QAR) and Shackleton Glacier (SG). Previous zircon U-Th/He (ZHe) ages from Beacon erratics collected in till along the TAM indicate that a heating event occurred around 180 million years ago (Ma); the temperature increased higher than the degree where helium is trapped within zircon crystals thereby reseting the ZHe ages. This is postulated to either be burial of the basin sediments deeply enough to reach 200˚C or from heat associated with either magmatic intrusions (Ferrar dolerite) or a higher geothermal gradient.

In general, ZHe ages range from ~110-170 Ma at SG and from ~100-195 Ma at QAR. ApHe ages range from ~85-170 Ma at SG and from ~35-125 Ma at QAR. The range in ages for each sample may be the result of inherited radiation damage to the mineral grain which influences the rate at which He diffuses from the grain. Overall the ZHe ages are similar at both locations, but the difference in ApHe ages indicate that SG experienced a much faster cooling history than QAR following the heating event which reset the ZHe ages. The difference in ApHe ages may be related to activity on nearby faults resulting in differing rates at which the rocks reached cooler temperatures.